# Nisqually National Wildlife Refuge

## Draft Comprehensive Conservation Plan and Environmental Impact Statement
## Thurston and Pierce Counties, Washington

Type of Action: Administrative

Lead Agency: U.S. Department of the Interior, Fish and Wildlife Service

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**Abstract:** Four alternatives, including a Preferred Alternative and a No Action Alternative, are described, compared, and assessed for Nisqually NWR. Alternative A is the No Action Alternative, as required by the National Environmental Policy Act regulations. Selection of this alternative would mean that a Comprehensive Conservation Plan (CCP) would not be finalized and implemented for the Refuge. This would result in continued management of the Refuge as it has been over the past several years, and the existing 1978 Nisqually NWR Conceptual Plan would not be updated. The four alternatives are summarized below:

**Alternative A—No Action: Status Quo** – This alternative assumes no change from past management programs and is considered the base from which to compare the other alternatives. There would be no changes to the Refuge boundary and no major changes in habitat management or public use programs.

**Alternative B—Refuge Expansion of 2,407 Acres and Minimum Estuarine Restoration** – This alternative would provide for moderate expansion of the Refuge boundary (2,407-acre addition). It places new management emphasis on the restoration of estuarine habitat and improved freshwater wetland management. The current environmental education program would be improved and expanded, to the largest degree of all action alternatives. There would be fewer changes to the trail system than in other action alternatives, and the Refuge would remain closed to waterfowl hunting, with the closure posted and enforced.

**Alternative C—Refuge Expansion of 2,407 Acres and Moderate Estuarine Restoration** – This alternative would provide for the same expansion of the Refuge boundary as in Alternative B (2,407-acre addition). However, it places a stronger emphasis on the restoration of estuarine habitat, while improving freshwater wetland and riparian habitats. The environmental education program would be improved and expanded, although serving fewer students than Alternative B. Moderate changes would occur to the trail system. The largest portion of Refuge acreage would be opened to waterfowl hunting of any alternative. Lands would be consolidated with State lands and waterfowl hunting limited to 3 days per week, if an agreement can be reached with WDFW.

**Alternative D—Preferred Alternative: Refuge Expansion of 3,479 Acres and Maximum Estuarine Restoration** – This alternative would provide for the largest amount of Refuge boundary expansion (3,479-acre addition). It would also maximize estuarine restoration, while improving freshwater wetland and riparian habitats on the Refuge. The environmental education program would be improved and expanded, although not to the highest expansion described in Alternative B. The greatest changes would occur to the trail system of any alternative. A smaller portion of Refuge lands would be opened to waterfowl hunting, 7 days per week, with no changes to hunting on WDFW lands.

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# Summary

## Introduction

Nisqually National Wildlife Refuge (NWR or Refuge) is located in western Washington at the southern end of Puget Sound (Figure S-1). The U.S. Fish and Wildlife Service (Service) has prepared a Draft Comprehensive Conservation Plan and Environmental Impact Statement (CCP/EIS), as summarized in this document, that describes four alternative approaches for managing Nisqually NWR over the next 15 years. Each alternative includes specific approaches for habitat management and public use; each action alternative also includes a proposed boundary revision that would expand Nisqually NWR. The Draft CCP/EIS describes the consequences of each alternative and its effectiveness in achieving Refuge goals and purposes.

Nisqually NWR is one of nearly 540 refuges in the National Wildlife Refuge System managed by the U.S. Fish and Wildlife Service. Wildlife conservation is the priority of National Wildlife Refuge System lands. Nisqually NWR contributes substantially to the conservation of fish, wildlife, and native habitats of the Puget Sound region. The Refuge is well known for its diversity of habitats and its unique location, where the Nisqually River flows into Puget Sound. The mixing of fresh and saltwater creates the Nisqually Estuary and delta, the most productive habitat type known. The Refuge protects one of the few relatively undeveloped large estuaries remaining in Puget Sound. It provides crucial habitat for migratory birds of the Pacific Flyway, including many waterfowl, shorebirds, waterbirds, and seabirds. The Refuge has regional importance as migration and rearing habitat for salmon, particularly the Federally threatened fall chinook salmon. Each year, more than 100,000 visitors come to view wildlife and enjoy and learn about Refuge habitats and the wildlife they support.

## Proposed Action

The Service proposes to adopt and implement a Comprehensive Conservation Plan (CCP) for Nisqually NWR that best achieves the Refuge's purpose, vision, and goals; contributes to the National Wildlife Refuge System mission; addresses the significant issues and relevant mandates; and is consistent with principles of sound fish and wildlife management. The Service examined a wide range of alternatives for future management of Nisqually NWR; of these, Alternative D would best achieve all of these elements, and, therefore, it was selected as the Preferred Alternative in this draft document.

## Purpose and Need for Action

A CCP is needed so that the highest priority natural resource needs will be more effectively addressed at Nisqually NWR. The Refuge is currently managed under an outdated 1978 Conceptual Plan. The purpose of the CCP is to shape the future of the Refuge and provide guidance for land protection, restoration, fish and wildlife, and visitor services to more

effectively achieve Refuge goals and purposes. Implementing the CCP would provide the Refuge an opportunity to enhance its critical role in the conservation and management of the fish and wildlife resources of the Nisqually River delta and lower watershed and continue developing high quality environmental education and wildlife interpretation for Refuge visitors.

Eighty percent of estuarine habitat has been lost in Puget Sound in the last 150 years, contributing to the decline of many fish and wildlife that depend on estuaries, including several salmon species. The Refuge's diked freshwater wetlands were historically estuarine and habitat quality has declined. The south Puget Sound region is undergoing dramatic changes in population and landscape as it becomes more urban. As Refuge visitor use has increased, so have conflicts among visitors and concerns over meeting the needs of fish and wildlife. The CCP provides a unique opportunity to consider increased land protection, restoration of an historic estuarine system, improved wildlife protection, and enhanced environmental education and wildlife-dependent recreation opportunities.

Specifically, the issues, concerns, and opportunities addressed in the Draft CCP/EIS include:

- Expansion of the Refuge boundary
- Restoration and extent of historic estuarine habitat
- Expansion of the environmental education program
- Changes to the trail system
- Providing sufficient wildlife sanctuary, eliminating unauthorized hunting, and deciding whether to implement a waterfowl hunt program
- Changes in fishing and shellfishing opportunities
- Changes in boating opportunities and reducing human disturbance to wildlife

Once finalized, the CCP will provide a clear statement of direction for the future management of Nisqually NWR. The CCP will ensure that the Refuge's management actions and programs are consistent with the mandates of the National Wildlife Refuge System and with Federal, State, and local plans. The CCP will also provide a basis for budget requests to support the Refuge's needs for staffing, operations, maintenance, and capital improvements.

## Brief History and Purpose of the Refuge

The proximity of the delta to major urban centers has exposed it to numerous development threats over the years. During the 1960s, the Nisqually delta was protected from development proposals largely through the efforts of citizens. By 1972, the Nisqually River Task Force recommended that the delta be set aside as a National Wildlife Refuge. Nisqually NWR was established in 1974 with the acquisition of 1,285 acres, in recognition of the area's unique fish and wildlife resources.

In 1977, an Environmental Assessment (EA) was completed that expanded the approved Refuge boundary to 3,780 acres, and a year later, a Conceptual Plan was developed for the Refuge.

Figure S-1 Regional Context

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These documents provided initial direction for managing wildlife, habitat, and public use. The currently approved boundary consists of 3,936 acres if the Refuge were fully acquired. Other ownerships within the approved boundary include Washington Department of Fish and Wildlife (WDFW) lands, and approximately 325 acres owned by the Nisqually Indian Tribe, which will be managed by the Service as part of the Refuge under a Cooperative Agreement.

The Service has acquired 76%, or 2,925 acres, within the approved Refuge boundary. These lands consist primarily of the lower Nisqually River, the delta estuary, McAllister Creek, diked freshwater wetlands and grasslands, and upland bluffs to the west. Refuge headquarters facilities are located at the southeast corner of the Refuge. The diked area includes approximately 1,000 acres of Refuge lands between the Nisqually River and McAllister Creek. These lands were historically estuarine, but they were diked by the early 1900s for farming and have been managed as diked freshwater wetlands and grasslands since the Refuge was established. Habitat quality has declined due to the rapid spread of non-native reed canary grass, difficulty in managing water levels, invasion of scrub-shrub, deterioration of the dikes, and the frequency of Nisqually River flooding and dike breaching. Frequent and costly dike breaching or repair has occurred in 1973, 1975, 1979, 1995-96, and 1997. The Nisqually Earthquake in February 2001 also caused extensive damages to the dike, and these damages are still being assessed.

Nisqually NWR was established in 1974 with the following purposes:

> *"for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 USC ss 715d, Migratory Bird Conservation Act)*
>
> *"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 16 USC 742f(a)(4) ... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude" ... 16 USC 742f(b)(1) (Fish and Wildlife Act of 1956)*

Refuge purposes, history, and existing conditions were all considered in development of the Draft CCP/EIS.

# Refuge Vision and Goals

## Vision

Nisqually National Wildlife Refuge is a landmark in the Pacific Northwest, located where the freshwater of the Nisqually River flows into Puget Sound. The estuary created by this mixing of fresh and saltwater is the richest kind of habitat known. Because of its biological significance, the Nisqually delta was registered as a National Natural Landmark. More than 275 species of migratory birds, many runs of salmon, and numerous other species come to rest, feed, nest, spawn, and grow. More than 100,000 visitors also come to view this special place each year, to enjoy and learn about these fish and wildlife and their habitats, and to share in the experiences of the delta.

The Service has a unique opportunity to restore Nisqually NWR as an historic tidal system, thereby benefitting many fish and wildlife species that depend on estuaries, including several salmon species and a wide variety of migratory birds. This restoration effort will contribute significantly to Puget Sound, where 80% of estuarine habitat has been lost in the last 150 years. Many migratory fish and wildlife move across the Refuge boundary into the lower Nisqually River watershed on a daily basis. Expanded land protection will be based on ecological needs to allow the Refuge to more effectively protect and restore the Nisqually delta, freshwater wetlands, and riparian forests critical to these fish and wildlife.

Nisqually NWR is located within 100 miles of more than 4 million people, providing tremendous opportunities for many to learn about and experience the diverse habitats, fish and wildlife, and restoration of an historic system. A model environmental education program will reach a diverse group of tomorrow's stewards and leaders, to help them learn about and participate in the protection and care of our natural areas. Quality wildlife-dependent recreation will be provided to thousands of people so they can enjoy the abundance of fish and wildlife in a diversity of habitats. New, accessible Refuge headquarters facilities provide an ideal venue for these opportunities.

Through strong partnerships and innovative outreach efforts, the Refuge will provide a unique opportunity to develop a model National Wildlife Refuge, providing leadership in habitat restoration and management, land protection, environmental education, and quality wildlife-dependent recreation. With the support of partners and the community, the Refuge will provide a focal point in the Nisqually River watershed and throughout Puget Sound to demonstrate sound land stewardship and restoration of native habitats on a large scale to benefit salmon and migratory birds. This is an unparalleled opportunity for people to learn about and help build the future of Nisqually National Wildlife Refuge.

## Goals

The following goals provide guiding principles for Nisqually NWR. They are consistent with Refuge purposes, Refuge System goals, the National Wildlife Refuge System Improvement Act of 1997, Service policy, and international treaties. These goals apply to all alternatives in the Draft CCP/EIS**.**

*Goal 1:* *Conserve, manage, restore, and enhance native habitats and associated plant and wildlife species representative of the Puget Sound lowlands, with a special emphasis on migratory birds and salmonids.*

*Goal 2:* *Support recovery and protection efforts for Federal and State threatened and endangered species, species of concern, and their habitats.*

*Goal 3:* *Provide quality environmental education opportunities focusing on the fish, wildlife, and habitats of the Nisqually River delta and watershed.*

*Goal 4: Provide quality wildlife-dependent recreation, interpretation, and outreach opportunities to enhance public appreciation, understanding, and enjoyment of fish, wildlife, habitats, and cultural resources of the Nisqually River delta and watershed.*

# Alternatives

The National Environmental Policy Act (NEPA) requires Federal agencies to evaluate a full range of reasonable alternatives to a proposed action. The NEPA alternative development process allows the Service to work with the public, stakeholders, interested agencies, and tribes to formulate alternatives that respond to identified issues.

Four alternatives are contained in the Draft CCP/EIS, including a "no action" alternative (as required under NEPA) and three "action" alternatives, each of which includes several components for managing Nisqually NWR over the next 15 years. Each alternative describes a combination of habitat and public use management prescriptions designed to achieve the Refuge purpose, goals, and vision. The four alternatives are briefly described below, followed by a summary of additional features common to some or all of the alternatives.

**Alternative A—No Action (Status Quo)**

This alternative assumes no change from past management programs and is considered the base from which to compare the other alternatives (Figure S-2). The Refuge would continue to acquire interests in the remaining 1,011 acres within the currently approved Refuge boundary (3,936 acres) as lands and funding become available, but no expansion would occur. There would be no major changes in habitat management or public use programs. The environmental education program would continue to serve approximately 5,000 students per year. No new internal dikes or impoundments would be created, but external dikes (28,000 linear feet) would need extensive repairs and continued maintenance.

**Alternative B—Refuge Expansion of 2,407 Acres and Minimum Estuarine Restoration**

This alternative would provide for moderate expansion of the Refuge boundary (a 2,407-acre addition for a total of 6,343 acres) (Figure S-3). It places new management emphasis on the restoration of estuarine habitat and improved freshwater wetland management. Approximately 318 acres (30%) of the diked interior would be restored to muted estuarine habitat by creating bridged breaches and retaining dikes. Approximately 140 acres (15%) of diked habitat would be restored to fully functional estuarine habitat in the northern half of the Shannon Slough system along McAllister Creek, requiring only limited dike removal. All remaining exterior dikes would require extensive repairs to prevent seepage and failure. Management of 542 acres of freshwater and grassland habitats would be improved in the remaining diked area by converting some grasslands to seasonal freshwater wetlands and ponds, and constructing five internal management units with new interior dikes, creating a higher proportion of freshwater habitat The current environmental education program would be improved and expanded to the largest degree of all action alternatives, serving 20,000 students per year. There would be fewer changes to the trail

system than in other action alternatives, and Service lands would remain closed to waterfowl hunting, with the closure posted and enforced to eliminate unauthorized hunting on the Refuge. Hunting would still occur on WDFW lands; therefore, a portion of the trail would continue to be seasonally closed.

### Alternative C—Refuge Expansion of 2,407 Acres and Moderate Estuarine Restoration

This alternative would provide for the same expansion of the Refuge boundary as in Alternative B (a 2,407-acre addition) (Figure S-4). However, it places a stronger emphasis on the restoration of estuarine habitat, while improving freshwater wetland and riparian habitats. This alternative would restore approximately 515 acres (50%) of the diked interior to estuarine habitat. This alternative would retain the Shannon Slough system along McAllister Creek as diked freshwater habitat. Exterior dikes would be removed in the northern half of the 1,000-acre diked area, and all remaining exterior dikes would require extensive repairs to prevent seepage and failure. Riparian habitat would be enhanced along the Nisqually River by restoring forested, surge plain habitat on 38 acres north of the Twin Barns. Management of the remaining 447 acres of freshwater and grassland habitats would be improved, with a higher proportion of freshwater habitat created by converting some grasslands to seasonal freshwater wetlands and ponds as well as constructing five internal management units with new interior dikes. The environmental education program would be improved and expanded to serve 15,000 students, fewer than in Alternative B, to provide sufficient staff time to operate a waterfowl hunt program. Moderate changes would occur in the trail system, reducing the 5½-mile loop to 3¾ miles; a new trail would be developed on tribal and Refuge properties east of the river. The largest portion of Refuge acreage (713 acres) would be opened to waterfowl hunting of any alternative, limited to 3 days per week, and consolidated in a block with WDFW lands (total hunt area, 1,170 acres), if an agreement could be reached with WDFW. New fishing opportunities would be provided including bank fishing on the east side of the Nisqually River, and improved bank fishing at Trotter's Woods south of I-5 and an accessible fishing site at Luhr Beach, if acquired.

### Alternative D—Preferred Alternative: Refuge Expansion of 3,479 Acres and Maximum Estuarine Restoration

This alternative would provide for the largest expansion of the Refuge boundary (a 3,479-acre addition for a total of 7,415 acres) (Figure S-5). It also maximizes estuarine restoration while improving freshwater wetland and riparian habitats on the Refuge. Under Alternative D, 699 acres (70%) of the diked area would be converted to estuarine habitat, resulting in removal of a large part of the exterior dike. Management of the remaining 263-acre area within the dike would be greatly improved as freshwater wetland and riparian habitats and five internal management units would be constructed with new interior dikes. As in Alternative C, 38 acres of forested, surge plain habitat would be restored to increase the acreage of this important habitat along the Nisqually River. The environmental education program would be improved and expanded (15,000 students per year), although not to the extent of Alternative B, to provide sufficient staff time to operate a waterfowl hunt program. The greatest changes would occur in the trail system of any alternative,

Figure S-2 Alternative A

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Figure S-3 Alternative B

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Figure S-4 Alternative C

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Figure S-5 Alternative D

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reducing the 5½-mile loop to a 3½-mile round trip trail no longer in a loop configuration; a new trail would be developed on tribal and Refuge properties east of the river. A smaller portion of Refuge lands (191 acres) would be opened to hunting, 7 days per week, with no changes to hunting on WDFW lands; however, a portion of the main trail would be seasonally closed. Bank fishing on McAllister Creek would no longer be offered due to dike removal, but new fishing opportunities would be provided, if appropriate lands were acquired along McAllister Creek south of I-5, as well as those described under Alternative C.

## Similarities Among Alternatives

Although the alternatives differ in many ways, there are similarities among them as well. Following is a list of: (1) the features common to all alternatives; and (2) features common to all action alternatives.

### Features Common to All Alternatives (A-D)

The following features are common to all alternatives:

- Interests would continue to be acquired in land contained within the currently approved boundary.
- Extensive repairs would be needed to prevent failure of the Brown Farm Dike (exterior dikes).
- Resource monitoring would be increased to support management.
- Restoration of native conifer forest would continue on the West Bluff parcel.
- Protection of the west side of McAllister Creek from trespass would be improved to reduce disturbance.
- Apple and berry picking would be restricted to consumption on site on trails only. Mushroom picking would continue to be prohibited to protect sensitive habitats.
- The new Visitor Center, 1-mile boardwalk trail, and public parking would continue to be provided.
- Cultural resources would continue to be protected.
- Tribal lands east of the Nisqually River within the Refuge boundary would be managed by the Service as part of Nisqually NWR under a Cooperative Agreement.
- Estuarine restoration would continue on tribal lands east of the Nisqually River.
- Treaty rights as reserved in Article 3 of the Treaty of Medicine Creek of 1854 (10 Stat. 1132) would be unaffected.
- Public access would continue to be restricted to trails only.
- A new ½-mile primitive trail would be established in the surge plain.
- A new education center would be constructed to support the environmental education program displaced from the Twin Barns Education Center by earthquake damage.
- Shellfishing would continue to be allowed according to County and State regulations.

**Features Common to All Action Alternatives (B-D)**

The following features are common to Alternatives B, C, and D, but would not be implemented as part of the No Action Alternative:

- Estuarine restoration areas would be closed to public access to provide wildlife sanctuary and a research study area to monitor restoration and fish and wildlife response with minimal disturbance.
- Fishing opportunities would be improved on the Nisqually River south of I-5 if appropriate properties were acquired or through cooperative agreement.
- Walk-in waterfowl hunting opportunities would be considered if sufficient lands are acquired south of I-5 that would provide adequate wildlife sanctuary and minimal conflict with other priority public uses.
- Requirements to keep the Research Natural Area (RNA) closed to consumptive uses would be enforced, so fishing, shellfishing, and waterfowl hunting would be prohibited there.
- Boat speeds would be limited to 5 miles per hour (mph) to reduce wildlife disturbance in all Refuge waters, and the RNA would be closed to boats October 1 to March 31 to provide winter sanctuary for migratory birds and other wildlife.
- Future boating restrictions would be considered if undue wildlife disturbance occurs.
- The Service would manage the Luhr Beach boat ramp area and Nisqually Reach Nature Center if the Service could develop a cooperative management agreement with WDFW.

# Affected Environment

The affected environment includes the CCP Study Area (9,326 acres), which includes the lands within the currently approved Refuge boundary and the potential Refuge expansion areas. The study area includes important portions of the Nisqually delta and lower reaches of the Nisqually River watershed in Pierce and Thurston counties. This area includes the McAllister Springs and Creek area, the Nisqually River corridor, Nisqually Valley agricultural lands and floodplain, and portions of the East Bluff north of I-5.

## Physical Environment

The Nisqually River originates on the south slope of Mt. Rainier and flows 78 miles into Puget Sound within the Refuge boundary, creating a 712 square mile drainage basin. McAllister Creek originates at McAllister Springs in the lower Nisqually River Valley. The Nisqually Estuary encompasses 5,016 acres and is influenced by a combination of freshwater flow from the Nisqually River and McAllister Creek and saltwater tidal patterns of Puget Sound.

## Vegetation and Habitat Resources

Over 80% of estuarine wetlands in Puget Sound have been lost to dredging, filling, diking, and industrial development. The Nisqually River Estuary is one of the most extensive and productive estuaries and one of the few remaining vegetated nearshore estuarine habitats in Puget Sound. However, intertidal emergent marsh habitat (salt marsh) in the delta has decreased 54% because of diking, channel migration and straightening, and land filling around I-5. Important habitat types within the estuary include high and low salt marsh habitats, intertidal areas, mudflats, and eelgrass beds, which are important sources of estuarine productivity.

Refuge freshwater wetlands are found within approximately 1,000 acres of the diked interior and include permanent and seasonal wetlands, wet meadows, and marshes. During the past 20 years, water level management has become increasingly difficult, and portions of the diked area are becoming too wet to easily manage. Large portions have gradually converted to shrub-scrub habitats.

Riparian and riverine habitats on the Refuge include the Nisqually River, McAllister and Red Salmon creeks, and adjacent riparian forests. Upland habitats include non-native grasslands, agricultural lands, and upland forests. Grassland and agricultural lands are dominated by non-native plant species. Upland forests include mixed coniferous-deciduous tree species found along delta bluffs and mixed deciduous forests scattered along the Nisqually Valley lowlands.

Nisqually NWR has numerous invasive weed species that compete aggressively with native plants. In particular, reed canary grass has invaded most seasonal freshwater wetlands and effective control is extremely difficult and costly. In 1997, reed canary grass dominated more than 30% of the diked interior, and it continues to spread rapidly.

## Fisheries Habitats and Resources

As many as 94 species of fish have been observed in the Nisqually River Basin, Estuary, and Reach, including salmonids, herring, smelt, surfperches, sandlances, and flatfish. Salmonids are probably the most abundant fish in the Nisqually Basin, including summer/fall chinook, winter chum, coho, and pink salmon, cutthroat, and summer and winter steelhead.

Extensive losses of salmonid populations have occurred in the Pacific Northwest. Adverse effects of habitat alterations, dams, and hatchery operations are widely recognized as major contributors to this decline. The importance of habitat for spawning and early life history is underscored in coastal watersheds with declining salmon populations. Chinook salmon are the most dependent on estuaries to complete their life cycle, followed by chum, pink, and coho salmon, and coastal cutthroat trout.

Many forage fish use the Nisqually River and Estuary, including herring, surf smelt, and Pacific sand lance. Forage fish have been recognized as important indicators of environmental health and as crucial prey items to many marine mammals, predator fish, and seabirds.

The Nisqually Basin provides habitat for Federally threatened species including chinook salmon, coho salmon (a candidate species), and bull trout.

## Wildlife

The mosaic of saltwater estuary, freshwater wetlands, riparian, and open or forested upland habitats at Nisqually NWR supports a diversity of more than 300 species of birds, mammals, reptiles, and amphibians, as well as large numbers of invertebrate species.

A wide variety of waterfowl use Refuge habitats and are considered an important wildlife component due to their abundance and the loss of available migration habitat elsewhere in the region. Primary use is during the migration periods, with many remaining through the winter, traveling between the estuary and flooded agricultural or grasslands on or off the Refuge. Dabbling ducks comprise over 90% of all Refuge waterfowl sightings, with peak waterfowl populations occurring during October or November and an annual average of 8,538 birds. American wigeon (76% of all dabblers) is the most abundant waterfowl species observed, with about 90% of wigeons found in estuarine habitats.

Waterbirds and seabirds commonly observed on the Refuge include great blue herons, Virginia rails, grebes, cormorants, and gulls. Great blue herons, a Washington State priority species, feed and nest on the Refuge. Nesting colony success on the Refuge has been declining since the mid-1990s.

Shorebird use of the Refuge is considered important due to the decline in available migration habitat. Large numbers of shorebirds, up to 22 species, feed on the Refuge mudflats and salt marsh as they migrate during spring and fall, predominately western sandpipers and dunlin.

More than 100 species of landbirds have been observed on the Refuge, including 22 species of raptors, 17 nonpasserines, and 77 species of passerines. Migratory landbirds are the subject of much concern due to indications of decline among many species. Landbirds are found in all habitats of the Refuge, including riparian forests, agricultural lands, and freshwater wetlands.

The Nisqually delta provides habitat for a number of marine mammals, including harbor seals, whale species, and two sea lion species. Forty-eight species of land mammals have been observed on the Refuge, including Columbian black-tailed deer, river otter, long-tailed weasel, mink, beaver, shrews, deer mice, and Townsend's voles.

Thirteen species of amphibians and reptiles have been observed on the Refuge, including red-legged frogs, Pacific tree frogs, garter snakes, and long-toed salamanders. Invertebrates provide an important food source for many fish and wildlife and include a wide variety of marine and terrestrial species.

Several non-native wildlife species pose a variety of existing or potential threats to native species on the Refuge. These include European starlings, bullfrogs, and eastern grey squirrels. Spartina, mitten, and green crabs occur in Puget Sound and pose a threat to Refuge wildlife.

Nisqually NWR provides habitat for four Federally threatened and endangered wildlife species: Federally threatened bald eagle, marbled murrelet, and Steller sea lion; and endangered brown pelican.

## Land Use

The Refuge is surrounded by low density residential and agricultural land uses. However, increasing demand for residential, commercial, and industrial land threatens natural resource areas, including estuaries, freshwater wetlands, and agriculture.

The Refuge consists of a variety of habitats providing wildlife-dependent recreation and education activities to an expanding regional population. Several special status lands have been designated within the Refuge, including a 2,765-acre National Natural Landmark (the Nisqually delta); a 740-acre Nisqually delta Research Natural Area; a 40-acre Public Use Natural Area in the Nisqually River surge plain; shorelines of significance in the Nisqually Reach and the lower Nisqually River; and the 5½-mile Brown Farm Dike National Recreation Trail.

## Special Uses

A number of special uses occur within the Refuge, including haying, scientific research, and tribal fishing. Haying is conducted on approximately 250 acres of non-native grasslands in late summer to provide fall browse for migrating waterfowl, primarily American wigeon. The Service encourages research that provides scientific data in support of Refuge management decision-making. Tribal fishing by members of the Nisqually Indian Tribe occurs in McAllister Creek, the Nisqually River, and adjacent marine waters, as provided for in the Treaty of Medicine Creek of 1854 (10 Stat. 1132).

## Public Access, Education, and Recreational Opportunities

More than 100,000 people per year visit Nisqually NWR to participate in a variety of wildlife-dependent recreational and educational activities, including wildlife observation, photography, interpretation, environmental education, and fishing. The Refuge has 7 miles of trails, including a 5½-mile loop trail and an accessible 1-mile boardwalk trail. The Refuge is very popular for wildlife and habitat viewing due to its location, diversity of wildlife, and trail access to diverse habitats. Nisqually NWR is considered by many to be one of the best birding areas in Puget Sound. Visitors entering the Refuge by canoe or kayak are also afforded excellent wildlife observation opportunities.

A new 4,800 square foot Visitor Center, with interpretive exhibits and an auditorium, was opened to the public in fall 1999. Trained Refuge volunteers staff the Visitor Center information desk.

Refuge staff and volunteers also conduct several special events throughout the year to help people learn more about Nisqually's fish and wildlife resources. A private non-profit group operates the separate Nisqually Reach Nature Center at Luhr Beach, on WDFW land.

Nisqually NWR is used as an outdoor classroom to enhance course curricula for preschool through college-age students. Each year, approximately 5,000 students and teachers participate in the Refuge's environmental education program. A replacement facility for the earthquake-damaged Twin Barns Education Center (temporarily relocated to a trailer) is required to upgrade education facilities and ensure a safe, quality experience. The Refuge provides planning assistance, field trip support by Refuge volunteers, and use of the education facilities to up to 100 students daily.

The Refuge offers fishing opportunities for salmon, steelhead, and trout in McAllister Creek and the Nisqually River, and for shellfish and bottomfish on the tideflats. An estimated 3,800 visitors fish at the Refuge each year, with most anglers accessing the Refuge by boat from Luhr Beach. Bank fishing is allowed in the McAllister Creek bank fishing area. Recreational shellfishers access the tideflats by foot from Luhr Beach; however, the shellfish beds were closed in spring 2000 due to elevated levels of fecal coliform.

Waterfowl hunting occurs on WDFW property within the Nisqually NWR boundary, but Refuge lands are not open to hunting. However, because Refuge and WDFW lands are not adequately signed, unauthorized waterfowl hunting does occur on portions of the Refuge that are administratively uncontrollable (Figure S-2). Annual hunter visits associated with WDFW lands in the delta were estimated at 1,000-1,200 hunter visits in 1998.

The primary non-wildlife dependent recreational activities that occur on the Refuge include boating, PWC use, and fruit and berry picking. Both motorized and non-motorized recreational boating occur in all waters of the Refuge outside the Brown Farm Dike, estimated at 6,700 boaters annually. PWC use occurs on the Refuge, mostly along McAllister Creek and in the Reach, causing disturbance to wildlife and trail users. Visitors are allowed to collect fruit and berries from trails and the parking lot; however, off-trail berry picking and trespass does occur.

## Cultural Resources

Aboriginal people used the delta estuary as a travel corridor for thousands of years and were known to have had a village at the mouth of the Nisqually River, as well as winter and seasonal camps at several locations on the Nisqually River. Nisqually NWR is the site where the Medicine Creek Treaty was signed in a grove of trees along the east bank of McAllister Creek in December 1854. Through this treaty, Indian tribes agreed to relocate to certain reservations and relinquished rights to the land but reserved certain fishing, hunting, and gathering rights. Members of the Nisqually Indian Tribe still exercise their treaty rights, fishing for salmon in Refuge waters.

Low-lying upland areas along the Nisqually River on the southeast corner of the current Refuge were the first to be cultivated by homesteaders. Portions of the Nisqually Estuary were diked beginning in the early 1870s, and the Brown Farm Dike was completed in the early 1900s to support farming, grow grain and hay, raise cattle and horses, and develop private hunting and fishing areas. Old pilings and cable in the surge plain forest indicate past logging activities.

### Socioeconomics

Nisqually NWR straddles the Pierce and Thurston county border within easy driving distance of approximately 4 million residents. The Puget Sound region contains the largest population concentration in the state and is expected to grow by 30% in the next 15 years. Consistent with regional trends, urban growth and resulting population pressures in the area surrounding the Refuge have expanded dramatically over the last 50 years.

In 1999, the Refuge contributed $380,000 to the local economy in the form of annual salaries and benefits, along with approximately $663,000 for goods and services. Consumer spending for wildlife-watching also has a significant effect on local, state, and national economic activity and employment. In 1996 almost $3 billion was spent on wildlife-associated recreation in Washington, and over $1.6 billion of the $3 billion was spent on wildlife-watching.

Thurston and Pierce counties are primarily supported by government, military, services, and retail employment. Agriculture is expected to remain an important part of the economy in south Puget Sound, although farmland is increasingly being developed. Approximately 916 acres of agricultural lands are located within the CCP Study Area.

## Environmental Consequences

Table S-1 at the end of this Summary lists the environmental consequences on Refuge resources that would be anticipated by implementing each of the alternatives. For the purposes of this Summary, multiple effects were often combined into a single code in the table, followed by brief explanations. A brief narrative description of the largest or most significant environmental consequences is included below. A more detailed analysis is presented in the Draft CCP/EIS document.

**Alternative A—No Action (Status Quo)**

No additional land protection outside of the current boundary would occur under this alternative; therefore, the biological benefits and public access opportunities associated with Refuge expansion would not occur. Except for some limited improvements in freshwater wetland management, habitat management would remain unchanged, and the quality of many habitats would continue to decline. Reed canary grass would continue to spread throughout freshwater wetlands on the Refuge. Historic estuarine habitat would not be restored and would continue to remain separated from Puget Sound, the Nisqually River, and McAllister Creek. Existing estuarine habitat outside the dikes would remain static or continue to decline due to its small size, altered physical processes,

and the effects of diking. The Nisqually River would continue to be contained within artificial dikes. Major repairs would be necessary throughout the exterior dike system, and the extensive exterior dike system (28,000 feet) would need to be maintained.

Salmon and many migratory birds that use estuarine and riparian habitats would not benefit because these habitats would continue to be limited. Those species or groups that primarily use freshwater wetlands or grasslands would continue to use existing habitats, including some land mammal, landbird, and waterbird species. However, the quality of this habitat would gradually decline. Endangered and threatened species, most of which are estuarine dependent, would not benefit further beyond existing conditions, and estuarine habitat conditions would decline.

The public use program would remain unchanged, so the environmental education program would remain limited in size and quality. Existing trails would remain unchanged, and the wildlife observation, interpretation, and photography programs would continue to be provided in their current state. Wildlife observation opportunities would not be improved further by habitat quality improvements or restoration. Unauthorized waterfowl hunting would continue to occur over large portions of the Refuge, providing no new sanctuary areas for wildlife. Confusion for hunters and others over boundaries would continue, as would conflicts between users, affecting many trail users during the hunting season. Fishing would continue unchanged, and no new accessible sites would be provided. Boating and PWC use would occur throughout Refuge waters, with no reduction in wildlife disturbance or conflicts with other Refuge visitors. Wildlife disturbance would not be reduced through greater protection measures, and no new wildlife sanctuary areas would be established.

**Alternative B—Refuge Expansion of 2,407 Acres and Minimum Estuarine Restoration**

Moderate Refuge boundary expansion would provide greater habitat and wildlife protection opportunities, particularly on the East Bluff and in the Nisqually Valley, providing benefits for watershed protection, wildlife corridors, riparian habitats, and freshwater wetlands. Some historic estuarine habitat would be restored. However, the retention of most exterior dikes would continue to impede the connection with Puget Sound, the Nisqually River, and part of McAllister Creek, creating the potential for fish entrapment, reduced sedimentation (important for marsh building), and impeded tidal circulation. Existing estuarine habitat outside the dikes would continue to be negatively affected by altered tidal and other physical processes. Restoration in the diked area in Alternative B would result in an increase of 30% intertidal emergent habitat (salt marsh) and a decrease of 1.7% freshwater wetlands in south Puget Sound.

Enhanced freshwater wetland management would produce a higher proportion of freshwater wetlands in relation to grasslands within the diked area. Reed canary grass would be eliminated in the restored estuarine area and more effectively controlled in the freshwater wetlands in the remaining diked area. The Nisqually River would continue to be contained within artificial dikes. Major repairs would be necessary throughout the exterior dike system, and a large amount of exterior dike (33,800 feet) would need to be maintained.

Salmon and many migratory birds that depend on estuarine and riparian habitats would benefit. Freshwater wetland management improvements would benefit some bird and land mammal species that rely primarily on these habitats. New freshwater wetland habitats could gain protection and be restored if acquired south of I-5, providing additional habitat for associated wildlife species. Endangered and threatened species, most of which are estuarine dependent, would directly benefit from estuarine restoration and expansion of the Refuge.

The environmental education program would be substantially improved and would benefit more students than any other alternative. The existing trail system would be the least changed of the action alternatives. Wildlife observation opportunities would be somewhat improved by habitat quality improvements and restoration.

Unauthorized waterfowl hunting would be discontinued by posting and enforcing no hunting regulations on Refuge lands. This change would provide more wildlife sanctuary, reduce confusion for hunters and other visitors, and reduce conflicts between users, although seasonal trail closures would continue to be a source of conflict. However, no waterfowl hunting opportunities would then be provided on the Refuge. Fishing opportunities would continue to be provided, with an improved fishing access at Trotter's Woods south of I-5 and an accessible fishing site at Luhr Beach if they were acquired or a cooperative agreement were developed. Several measures would be included to reduce wildlife disturbance and provide improved sanctuary. These include a 5 mph boat speed restriction; a seasonal (winter) boat closure in the RNA; enforcement of the RNA closure to consumptive uses; and closure of restored estuarine areas to public access.

**Alternative C—Refuge Expansion of 2,407 Acres and Moderate Estuarine Restoration**

Moderate Refuge boundary expansion would provide greater habitat and wildlife protection opportunities, as described under Alternative B. More estuarine habitat would be restored to full function and connected with Puget Sound, the Nisqually River, and part of McAllister Creek. The Nisqually River would be allowed to flow more freely and could more effectively distribute important sediments to the restored area. However, a portion of McAllister Creek would remain diked, including the large Shannon Slough system. During extreme flood events, all flood waters would continue to empty within diked habitats on the Refuge. An historic riparian area would be restored, providing 38 additional acres of this important habitat. Restoration in the diked area in Alternative C would result in an increase of 33.7% intertidal emergent habitat (salt marsh) and a decrease of 1.9% freshwater wetlands in south Puget Sound.

Improved freshwater wetland management in the diked area would produce a higher proportion of freshwater wetlands in relation to grasslands and require intensified management. Reed canary grass would be eliminated in this larger restored estuarine area and more effectively controlled in the freshwater wetlands in the remaining diked area. Major repairs would be necessary throughout the remaining exterior dike system and a significant amount of exterior dike (15,600 feet) would need to be maintained.

Salmon and many migratory birds that depend on estuarine and riparian habitats would benefit considerably more than under Alternative B, owing to the greater increase in estuarine habitat. Freshwater wetland management improvements would benefit some bird and land mammal species that rely primarily on these habitats. New freshwater wetland habitats could gain improved protection and be restored if acquired south of I-5, benefitting birds and land mammals associated with these habitats. Endangered and threatened species, most of which are estuarine dependent, would directly benefit from estuarine restoration and expansion of the Refuge.

The environmental education program would be substantially improved and would benefit many students, although not as many as in Alternative B. The main loop trail would be reduced in length, but the quality of wildlife viewing would improve as a result of improved management and restoration. A new trail would be provided on the east side of the Nisqually River on Refuge and tribal lands, providing substantial new public access opportunities.

The largest amount of Refuge acreage would be opened to waterfowl hunting, and hunting would be consolidated in a single block if an agreement could be reached with WDFW. This alternative would provide the most improved wildlife sanctuary by discontinuing unauthorized hunting and removing hunting from McAllister Creek. However, the RNA would be reduced in size to accommodate the hunt area. Alternative C most effectively reduces confusion for hunters and conflicts between users, because it would create the easiest hunt area to sign and delineate and no seasonal trail closures would be required. Fishing opportunities would continue to be provided, with an improved fishing access at Trotter's Woods south of I-5 and an accessible fishing site at Luhr Beach if they were acquired or a cooperative agreement were developed. A new bank fishing opportunity would be provided associated with a new trail on the east side of the Nisqually River. This alternative would also provide several measures to reduce wildlife disturbance and provide improved sanctuary, as described under Alternative B.

**Alternative D—Preferred Alternative: Refuge Expansion of 3,479 Acres and Maximum Estuarine Restoration**

Alternative D includes the largest boundary expansion, which would provide the most habitat and wildlife protection opportunities, particularly in riparian habitat along the Nisqually River corridor compared to Alternatives B and C. The largest estuarine restoration area would be returned to full function and connected with Puget Sound, the Nisqually River, and all of McAllister Creek. As in Alternative C, the Nisqually River would be allowed to flow more freely and could more effectively distribute sediments to the restored area. During extreme flood events, a portion of flood waters would empty into restored estuarine habitat along McAllister Creek instead of diked habitats, reducing future flooding on the Refuge. An historic riparian area would be restored, providing 38 additional acres of this important habitat, similar to Alternative C. Restoration in the diked area in Alternative D would result in an increase of 45.7% intertidal emergent habitat (salt marsh) and a decrease of 2.6% freshwater wetlands in south Puget Sound.

Improved freshwater wetland management in the diked area would produce a higher proportion of freshwater wetlands in relation to grasslands and the most intensified management of all

alternatives. Reed canary grass would be eliminated in this largest restored estuarine area and most effectively controlled in the freshwater wetlands in the remaining diked area. A limited amount of existing exterior dike would require repairs, and the smallest amount of exterior dike (15,000 feet) would need to be maintained.

Salmon and many migratory birds that depend on estuarine and riparian habitats would benefit the most under Alternative D. Freshwater wetland management improvements would benefit some bird and land mammal species that rely primarily on these habitats; however, total acreage remaining within dikes would be lowest in Alternative D. Wildlife that use primarily grasslands would be most affected by this reduced acreage. New freshwater wetland habitats could gain improved protection and be restored if acquired south of I-5, providing benefits to wildlife associated with these habitats. Alternative D would benefit endangered and threatened species the most, due to the largest amount of estuarine restoration and Refuge expansion, for these mostly estuarine dependent species.

Similar to Alternative C, the environmental education program would be substantially improved and benefit many students, although not as many as in Alternative B. The main loop trail would be reduced in length the most, but the quality of wildlife viewing would improve as a result of improved management and restoration. A new trail would be provided on the east side of the Nisqually River on Refuge and tribal lands, providing substantial new public access opportunities.

A limited portion of the Refuge would be opened to waterfowl hunting. This would make it possible to delineate the hunting area (Refuge and State lands) and provide improved wildlife sanctuary by discontinuing unauthorized hunting. However, the RNA would be reduced in size to accommodate the hunting area. Alternative D would reduce confusion for hunters and conflicts between users; however, a seasonal trail closure would still be implemented on a portion of the main trail to avoid conflicts on WDFW lands. Fishing opportunities would continue to be provided; however, anglers would be negatively affected by the loss of bank fishing on McAllister Creek due to the removal of dikes. However, the closure of the McAllister Creek Hatchery (July 2002) is expected to greatly reduce fishing opportunity, lessening the effect of this loss. A new Refuge bank fishing site to replace the McAllister Creek site would be sought south of I-5 if appropriate lands were acquired along McAllister Creek, as would improved fishing access at Trotter's Woods south of I-5 and an accessible fishing site at Luhr Beach if acquired or a cooperative agreement were developed. A new bank fishing opportunity would be provided, associated with a new trail on the east side of the Nisqually River. This alternative would also provide several measures to reduce wildlife disturbance and provide improved sanctuary, as described under Alternative B.

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**Table S-1. Summary of Potential Effects of Alternatives A, B, C, and D.**

| Resource Issue or Concern | Alternative A | Alternative B | Alternative C | Alternative D |
|---|---|---|---|---|
| **PHYSICAL ENVIRONMENT** | | | | |
| Hydrological connection between restored areas and Puget Sound, Nisqually River, and McAllister Creek. | EC | SH | MH | CH: The Nisqually River would be allowed to move more freely, the entire McAllister Creek system would be restored, and less flood waters would flow into the diked area during flood events. |
| **HABITATS** | | | | |
| Estuarine | EC | MH: 318 acres muted estuarine and 140 acres of full estuarine habitat with a connection to McAllister Creek. | MH: 515 acres with a full tidal connection to Puget Sound, and some of Nisqually River and McAllister Creek. | CH: 699 acres with full tidal connection to Puget Sound, Nisqually River, and all of McAllister Creek. |
| Freshwater Wetland | SH: Limited improvements. | MH: 542 acres improved management of diked area and protection of some areas south of I-5. | CH: 447 acres improved management with a higher proportion of freshwater wetlands than grasslands and protection of some areas south of I-5. | MH: 263 acres improved management with a high proportion of freshwater wetlands and some grasslands and protection of some areas south of I-5. |
| Riverine and Riparian | | | | |
| Restoration | SH | SH | MH: Additional 38 acres. | MH: Additional 38 acres. |
| Increased Protection | EC | MH: Additional 325 acres. | MH: Additional 325 acres. | MH: Additional 1,011 acres. |
| Upland | | | | |
| Upland Forests | EC | MH: Increased protection of 803 acres. | MH: Increased protection of 803 acres. | MH: Increased protection of 1,262 acres. |
| Grasslands | SL | ML: Some loss of grasslands within diked area, but some increased protection in expansion area. | CL: Loss of grasslands within diked area, but some increased protection in expansion area. | CL: Loss of grasslands within diked area, but some increased protection in expansion area. |

EC = existing conditions; SH = slightly higher (or improved) than existing conditions; MH = moderately higher (or improved) than existing conditions; CH = considerably higher (or improved) than existing conditions; SL = slightly lower (or decreased) than existing conditions; ML = moderately lower (or decreased) than existing conditions; CL = considerably lower (or decreased) than existing conditions.

**Table S-1. Summary of Potential Effects of Alternatives A, B, C, and D.**

| Resource Issue or Concern | Alternative A | Alternative B | Alternative C | Alternative D |
|---|---|---|---|---|
| **EXOTIC PLANTS** | | | | |
| Reed canary grass | SL: Continued dominance and spread within diked area. | MH: Improved control within diked area and elimination in restored estuarine areas. | CH: Improved control within diked area and elimination in restored estuarine areas. | CH: Improved control within diked area and elimination in restored estuarine areas. |
| **FISHERIES HABITATS AND RESOURCES** | EC | SH | MH | CH: Greatest estuarine restoration and riparian restoration and protection, contributing to salmon recovery. |
| **BIRDS** | | | | |
| General Effects | EC | Slightly more estuary; somewhat improved freshwater wetlands; increased habitat protection in expansion area; and more sanctuary. | More estuary; improved freshwater wetlands; restored riparian; increased habitat protection in expansion area; and most sanctuary, including McAllister Creek. | More estuary; improved freshwater wetlands; restored riparian; largest increased habitat protection in expansion area, particularly riparian; and more sanctuary. |
| Waterfowl | EC | MH | MH - CH | CH |
| Waterbirds | EC | MH | SH - MH | SH - MH |
| Seabirds | EC | SH | MH | CH |
| Shorebirds | EC | SH | MH - CH | CH |
| Landbirds | EC | SL | SH - MH | SH - MH |
| **MAMMALS** | | | | |
| Marine | EC | SH | MH | MH |
| Land | EC | SL: Slight decrease in diked areas; increased upland forest and freshwater wetland protection in expansion area. | ML: Some decrease in diked areas; increased upland forest and freshwater wetland protection in expansion area. | ML: Largest decrease in diked areas; largest upland forest and freshwater wetland protection in expansion area. |

EC = existing conditions; SH = slightly higher (or improved) than existing conditions; MH = moderately higher (or improved) than existing conditions; CH = considerably higher (or improved) than existing conditions; SL = slightly lower (or decreased) than existing conditions; ML = moderately lower (or decreased) than existing conditions; CL = considerably lower (or decreased) than existing conditions.

**Table S-1. Summary of Potential Effects of Alternatives A, B, C, and D.**

| Resource Issue or Concern | Alternative A | Alternative B | Alternative C | Alternative D |
|---|---|---|---|---|
| **REPTILES AND AMPHIBIANS** | EC | SL | SL | ML |
| **INVERTEBRATES** | | | | |
| Marine<br>Terrestrial | EC<br>EC | SH<br>SL: Slight decrease in diked areas; increased upland forest and freshwater wetland protection in expansion area. | MH<br>ML: Some decrease in diked areas; increased upland forest and freshwater wetland protection in expansion area. | CH<br>ML: Largest decrease in diked areas; largest upland forest and freshwater wetland protection in expansion area. |
| **ENDANGERED & THREATENED SPECIES** | EC | SH | MH | CH |
| **SPECIAL USES** | | | | |
| Haying | EC | SL: Haying area reduced by 5 acres. | ML: Haying area reduced by 69 acres. | CL: Haying area reduced by 118 acres. |
| **EDUCATIONAL AND RECREATIONAL OPPORTUNITIES** | | | | |
| Environmental Education | EC | CH | MH | MH |
| Wildlife Observation, Interpretation, and Photography | EC | SH | MH: Trail length is shortened but improved quality with diversified viewing opportunities; new eastside trail. | MH: Trail length is shortened but improved quality with diversified viewing opportunities; new eastside trail. |

EC = existing conditions; SH = slightly higher (or improved) than existing conditions; MH = moderately higher (or improved) than existing conditions; CH = considerably higher (or improved) than existing conditions; SL = slightly lower (or decreased) than existing conditions; ML = moderately lower (or decreased) than existing conditions; CL = considerably lower (or decreased) than existing conditions.

**Table S-1. Summary of Potential Effects of Alternatives A, B, C, and D.**

| Resource Issue or Concern | Alternative A | Alternative B | Alternative C | Alternative D |
|---|---|---|---|---|
| Waterfowl Hunting | | | | |
| Acreage | EC | CL: Refuge land posted closed to hunting. | CH: 713 acres of Refuge land (1,170 acres consolidated hunt area with State lands). | MH: 191 acres of Refuge land (total 808 acres hunt area with State lands). |
| Quality | EC | SH: Eliminate boundary confusions. | CH: 3 day/wk hunt, 25-shell limit, eliminate boundary confusions. | MH: Eliminate boundary confusions, 25-shell limit. |
| Conflict with other users | EC | SL - ML | CL | SL - ML |
| Available Sanctuary | EC | MH | CH: Hunting removed from McAllister Creek. | MH |
| Fishing and Shellfishing | EC | MH: Additional location at Trotter's Woods and disabled access location at Luhr Beach. | CH: Additional locations at Trotter's Woods, eastside property, and disabled access location at Luhr Beach. | MH: Additional locations at Trotter's Woods, eastside property, and disabled access locations at Luhr Beach and Nisqually, but loss of McAllister Creek site with possible replacement if lands acquired south of I-5. |
| Boating | EC | ML: 5 mph speed limit, seasonal closure of RNA. | ML: 5 mph speed limit, seasonal closure of RNA. | ML: 5 mph speed limit, seasonal closure of RNA. |
| **CULTURAL RESOURCES** | | | | |
| | EC: Some effects to Brown Farm Dike from needed repairs. | MH: Some modification and removal of Brown Farm Dike; majority of dike remains; improved interpretation and EE of cultural resources; and improved protection of sites in expansion areas. | SH: Portions of Brown Farm Dike removed; improved interpretation and EE of cultural resources; improved protection of sites in expansion areas. | SL - SH: Majority of Brown Farm Dike removed; improved interpretation and EE of cultural resources; largest protection of sites in expansion areas. |

EC = existing conditions; SH = slightly higher (or improved) than existing conditions; MH = moderately higher (or improved) than existing conditions; CH = considerably higher (or improved) than existing conditions; SL = slightly lower (or decreased) than existing conditions; ML = moderately lower (or decreased) than existing conditions; CL = considerably lower (or decreased) than existing conditions.

**Table S-1. Summary of Potential Effects of Alternatives A, B, C, and D.**

| Resource Issue or Concern | Alternative A | Alternative B | Alternative C | Alternative D |
|---|---|---|---|---|
| **SOCIOECONOMICS** | | | | |
| Special Status Lands | | | | |
| Research Natural Area | EC | CH: Removal of consumptive uses and seasonal boat closure. | MH: Removal of consumptive uses and seasonal boat closure, but reduced by 166 acres. | MH: Removal of consumptive uses and seasonal boat closure, but reduced by 73 acres. |
| National Recreation Trail | No change in status. | No change in status. | SL: Retain status, but re-describe. | ML: Retain status, but re-describe. |
| National Natural Landmark | No change in status. | No change in status. | SH: Enlarged area of designated habitat. | MH: Enlarged area of designated habitat. |
| Regional Economy | EC | SH | MH | MH |
| Recreation Economics | EC | SH | MH | MH |

EC = existing conditions; SH = slightly higher (or improved) than existing conditions; MH = moderately higher (or improved) than existing conditions; CH = considerably higher (or improved) than existing conditions; SL = slightly lower (or decreased) than existing conditions; ML = moderately lower (or decreased) than existing conditions; CL = considerably lower (or decreased) than existing conditions.

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